Dielectric®

RIGID COAXIAL TRANSMISSION LINE

INSTRUCTION MANUAL

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VERTICAL RUN CONSIDERATIONS

Provision must be made to accommodate the differential expansion between the cooper of the line and the steel of the tower. Temperature rise due to RF heating as well as ambient temperature changes must be taken into account. In the vertical run, this is accomplished by fixing the line at the tower top and "floating" it down the tower on spring hangers with expansion accumulating at the bottom of the tower. To accommodate this movement, the length of the horizontal run must be as specified in Table IV. In addition, the vertical run must be allowed to bend to accommodate movement in the horizontal run. This is assured by proper placement of the first vertical supporting as specified in Table V.

Generally, only standard lengths should be included in the vertical run except at the top where a field cut section is utilized. However, one or two special lengths may be inserted if it permits a better pattern of hangers. The position of flanges relative to hangers, guide rings and tower members must be carefully planned to avoid interference.

Ideally, the spring hangers supporting the vertical run of transmission line should be installed every 10 feet (3.1 m); however, minor variations may be used provided an average of one hanger for each 10 feet of line is maintained. The vertical portion of line near the top of the run should be anchored firmly using the appropriate fixed hanger(s). Spring-loading charts are used to set spring tensions of expansion hangers. See Fig. 1 & 2. After final installation, the line must be vertical and free to move in the hanger guides, and the hanger supports must keep the vertical hangers perpendicular to the line. The steel used to mount the top fixed hanger(s) must be sufficient to resist the large upward force on the vertical run. When installing transmission line, the preferred method is to start at the bottom and work toward the top. The transmission line must be mounted with the anchor insulator of each section at the top end.

The elbow which joins the vertical and horizontal runs should be a reinforced type.

HORIZONTAL RUN CONSIDERATIONS

In complex horizontal-line layouts involving elevation and direction changes, care must be exercised not to overstress mitre elbows or introduce excessive flexing of the line. Back to back elbows may be used to achieve desired vertical and horizontal angles.

As stated previously, the horizontal run should be at least as long as indicated in Table V, to allow for sufficient movement due to expansion of the vertical run. Adequate bending of the vertical line run to allow for movement of the horizontal run is assured by proper placement of the first vertical supporting ring as specified in Table IV. Three-point-suspension spring hangers should be used in the horizontal run for at least the distance shown in Table V. Beyond the minimum distance specified, horizontal roller assemblies or swivel hangers may be used to support the line. Where several lines are in close proximity, special provision may be required to prevent lateral movement while allowing vertical movement. The line should be secured at the wall of the building using a horizontal anchor plate. Lines should be protected from falling ice.

INDOOR INSTALLATION CONSIDERATIONS

The indoor part of the transmission line is normally not pressurized. Therefore, a gas stop is installed inside the building wall, and unpressurized line components are used between that point and the output of the transmitter. The arrangement permits disconnecting the ungassed portion of the line anywhere before the gas stop without loss of pressure in the outside line.

Indoor runs should be provided with a convenient arrangement of fittings on the output lines of the visual transmitter, aural transmitter and filterplexer to facilitate connection of a wattmeter and Dielectric dummy load.

PURGING MOISTURE FROM NEW LINE

A transmission line installation must be free of moisture before power is applied. Operating a line with moisture inside is likely to cause substantial damage. If moisture is suspected, the uppermost part of the line should be opened by using the petcock supplied or by slightly loosening the most-distant flange. The line should then be bled with dry (oil-pumped) nitrogen. Lines should be continuously pressurized from a nitrogen or a dry air source. After any complete loss of pressure where moisture may have entered, the line should be purged before it is again placed in use.

Should it be necessary to identify a leak, use non-ammonia based leak detection soap, such as *Snoop*, by Swagelok. If unavailable use a simple mixture of dish detergent and water. Ammonia and ammonia-based chemicals are extremely incompatible with brass and brass is one of the main components in transmission line and antenna systems. Ammonia makes the brass more susceptible to stress-corrosion cracking.

INSTALLATION PRECAUTIONS

Care is required in handling the various transmission line components to prevent damage and assure proper installation. Procedures are outlined in "Transmission Line Do's and Don'ts." These recommendations are important.

Tower steel must be designed to support the vertical run in a straight line and maintain line clearance within spring hanger guide rings under load.

TRANSMISSION LINE DO's AND DON'Ts

DO

1. DO store packaged transmission line in clean dry place to prevent contamination.
2. DO withdraw and inspect inner and outer conductors completely if in previously opened or damaged shipping boxes.
3. DO withdraw and inspect all short pieces of line.
4. DO check operation of inner expander assembly* and any components suspected of contamination with dirt or moisture.
5. DO cap all unpacked components against the entry of moisture.
6. DO hoist components with connector end up unless component is marked otherwise.
7. DO check the line in the spring hanger guides after each section is installed to ensure free movement for expansion. Shimming of guides at tower support may be necessary.
8. DO consult spring-loading dimensions (Fig. 1 or 2) for proper spring tension on expansion hangers and adjust each position on the tower accordingly.
9. DO ascertain that inner conductors of adjacent sections match alignment to prevent inadvertent damage to the connector. Hold top connector insulator in place and see that the insulator is well sealed before installing the next section.
10. DO tighten flange bolts alternately, one side, then the other, before final torquing. See Table VI.
11. DO use torque wrench for final tightening. See Table VI.
12. DO pressurize line immediately following installation and maintain 3 lbs/in (0.21 kg/cm) at all times. Leaks must be repaired immediately.
13. DO keep ends of transmission line capped during installation. If installation is halted, seal installed line ends and pressurize to at least 0.5 lbs/in (0.04 kg/cm) with dry air or nitrogen.
14. DO coat O-ring gaskets lightly with Dow-Corning DC-4 silicone compound to ease assembly.
15. DO check O-ring and its groove for dirt or other foreign material and ascertain that ring is properly sealed before flange assembly.

*Check inner conductor expansion joint for an excursion of 0.2 inch (5mm) travel and in the extended position check for presence of contacting spring through exposed groove on inner conductor. In some lines the contacting spring is not visible in the extended position. Presence of the spring can be determined by inserting a 6-mil (0.15 mm) thick feeler gauge (0.5-inch or 13-mm wide) between the tubing inner surface and the connector body outer surface. If spring is present the feeler gauge can be inserted 0.25 inch (6.4 mm). If gauge goes in 0.5 inch (13 mm), spring is missing and the line section must not be used.

DON'T

1. DON'T withdraw complete inner conductor line section if shipping box appears to be new and intact. ONLY inspect inner conductor expander.
2. DON'T hoist coupled sections of transmission line. The stresses involved damage components.
3. DON'T use force when fitting components together. If cause cannot be corrected or isn't evident visually, call Dielectric for assistance.
4. DON'T assemble line components that contain water or condensation.
5. DON'T assemble line components that contain dust, dirt, packing material or other foreign objects. Contact Dielectric regarding any loose or suspicious material in the line as it is unpacked.
6. DON'T assemble match-marked components unless the marking is clear and understood. DON'T interchange match-marked items. Consult Dielectric about proper assembly.
7. DON'T install any line component with dust, dirt or grease on insulators.
8. DON'T install line that exhibits any evidence of damage.
9. DON'T attempt to correct defects unless instructed and authorized by Dielectric.
10. DON'T dismiss rigger until transmission line is completely installed and pressurized for at least 12 hours and the appropriate electrical tests are performed.
11. DON'T power the transmission line until the line is known to be dry and pressurized to at least 3 PSI.
12. DON'T over pressurize the line. Operating pressure of the transmission line should be between 3PSI and 6PSI
13. DON'T exceed specified torque for flange bolts (see Table VI).
14. DON'T use a line flange that shows evidence of being overstressed.
15. DON'T use a damaged o-ring. Use a new o-ring whenever in doubt.
16. DON'T bend elbow components to fit. If leg angle is incorrect, consult Dielectric.
17. DON'T let rigging equipment damage components. Provide proper protection.
18. DON'T cut tubing without cut-off gauge. If line is cut, remove all burrs and chips from inside and outside of tubing.
19. DON'T assemble a horizontal run without proper support.

GENERAL COMPONENTS, DESCRIPTIONS, AND LOCATIONS

1. GAS STOP
   Normally one gas stop is needed at each end of a coax run. Gas stops are used to stop dry air from entering into an area which does not require pressurization, or when different pressurizations are required.
2. GASSING KIT
   This supplies the connection of the tube and fittings from the dehydrator to the gas stop.
3. DEHYDRATOR
   Select the proper size dehydrator from Table III for the size and length of coax run.
4. SINGLE SWIVEL HANGERS
   These are used to provide a method to hang a single coax inside the transmitter room. These should be spaced approximately 10 ft. apart.
5. DUAL SWIVEL HANGERS
   These provide the user the ability to hang two runs of coax side by side inside the transmitter room. These should be spaced approximately 10 ft. apart.
6. RIGID FLANGED COAXIAL TRANSMISSION LINE
   This line is normally supplied in 19-1/2 ft., 19-3/4 ft., and 20 ft. lengths. They are bolted end to end with the connector always on the end towards the antenna or tower top. This allows observation of its condition and the coax contact prior to the installation of the next mating piece. Hardware is always supplied for one end of each component. See DO'S and DONT'S.
7. RIGID UNFLANGED COAXIAL TRANSMISSION LINE
   The unflanged coax is normally used inside the transmitter room where internal pressurization is not required.
8. HORIZONTAL ANCHOR PLATE
   These are normally used to anchor the coaxial transmission line to the building. They also permit the user to seal the building from the outside weather.
9. HORIZONTAL SPRING HANGERS (THREE POINT)
   These hangers are used to suspend the horizontal run and provide flexibility when warranted by expansion and contraction due to heating and cooling of the line. These are to be spaced 10 ft. apart.
10. HORIZONTAL ROLLERS
    This type of hanger is used only when the horizontal run far exceeds the length required to compensate for the vertical run. The hangers closest to the tower will require three-point suspension and rollers may be used beyond the required horizontal length (See Table IV).
11. LATERAL BRACES
    Used to restrict lateral motion of coax while permitting vertical and horizontal movement. One is normally attached at the bottom of the vertical run.
12. ELBOWS
    Two styles are usually available, "Equal leg" and "Unequal leg." It is suggested that the unequal leg elbow be used in most places because it provides the maximum amount of support on the inner conductor. Equal leg elbows may be used to save space. Normally this is used at the bottom of the tower, in the elbow complex at the tower top and inside the building.

    To provide extra strength of the outer conductor, we supply a reinforced type elbow for use on the tower. See DO'S and DON'TS & Torque specifications (Table VI).
13. VERTICAL SPRING HANGERS
    These hangers support the vertical run of coax and provide the flexibility required for vertical expansion and contraction due to temperature changes. See DO'S and DON'TS. Also see Spring Hanger Charts.
14. SOFT SOLDER FIELD FLANGES
    This provides the user with the ability to cut a section of coax to length and affix a flange using soldering equipment readily available in the field.
15. CUT OFF GUIDES
    Inner and outer cut off guides are required when doing an installation.

    The purpose is to aid the user and produce an even, square cut when trimming a piece of coax to a required length.
16. END CAP
    These are used for a temporary closure of transmission line to prevent entrance of moisture and dust.
17. REDUCERS
    These are only provided where a reduction of coax size is needed. Two methods of reduction are available; one which reduces one size at a time and the other reduces two sizes at a time.
18. FIXED HANGERS
    These are used normally at the tower top to fix the vertical run in place.

TRANSMISSION LINE INSTALLATION

To assure proper flange alignment, pins have been placed in each flange and an alignment hole in the opposite side of the flange. The line is simply rotated until the pins align with the holes.

In order to provide pressurization, each piece of line is supplied with one o-ring seal. Care must be taken not to pinch or cut the seal during the installation. Also, a small amount of silicone grease may be applied to aid in sealing the joint. Only a shiny layer is sufficient; an overabundance may cause damage to the coax internally.

SELECTING YOUR TRANSMISSION LINE LENGTH

On long transmission lines, allowances must be provided for differential expansion between outer and inner conductors. Therefore, the inner conductor provides for some relative internal movement of inner and outer conductors. The result is a very small electrical discontinuity which is a function of differential temperature and which can be compensated at only one temperature. These discontinuities are a fixed distance apart and numerous in a long run of line. This combination can represent undesirable VSWR additions at frequencies that coincide with a multiple of half wavelengths. If the operating frequency should coincide with one of the critical frequencies for 20-foot section lengths, 19-3/4 foot or 19-1/2 foot sections may be used to avoid the addition of VSWR reflections. Table I shows the critical frequencies for each section length.

Recommended Section Lengths – U.S. Channels

Channel No.	20’	19-3/4’	19-1/2’		Channel No.	20’	19-3/4’	19-1/2’
2	•				36	•		
3	•				37			•
4			•		38			•
5	•				39	•		
6	•				40	•		
FM*					41			•
7	•				42			•
8	•				43	•		
9	•				44	•		
10			•		45		•	
11	•				46			•
12	•				47	•		
13	•				48	•		
14	•				49		•	
15	•				50			•
16			•		51	•		
17			•		52	•		
18	•				53		•	
19	•				54			•
20			•		55	•		
21			•		56	•		
22	•				57		•	
23	•				58			•
24		•			59	•		
25			•		60	•		
26			•		61		•	
27	•				62			•
28	•				63	•		
29			•		64	•		
30			•		65		•	
31	•				66		•	
32	•				67	•		
33			•		68	•		
34			•		69		•	
35	•							

* For full FM band operation 17 1/2' line sections are recommended. For single channel applications standard line lengths can be used.

TABLE I

VSWR Maximum Limit Values

CHANNEL RANGE	LENGTH T/L RUN	3-1/8 DIA.	4-1/16 DIA.	6-1/8 DIA.	7-3/16 DIA.	8-3/16 9-3/16 DIA.
2-6 and FM	0 to 1000'	Regular 1.05	Regular 1.05	Regular 1.05	Regular 1.05	Regular 1.05
	1000' to 1500'	Regular 1.06	Regular 1.06	Regular 1.06	Regular 1.06	Regular 1.06
	0 to 1000'	*Special 1.04	*Special 1.04	*Special 1.035	*Special 1.035	*Special 1.03
	1000' to 1500'	*Special 1.05	*Special 1.05	*Special 1.05	*Special 1.05	*Special 1.05
7-13	0 to 1000'	Regular 1.05	Regular 1.05	Regular 1.05	Regular 1.05	Regular 1.05
	1000' to 1500'	Regular 1.06	Regular 1.06	Regular 1.06	Regular 1.06	Regular 1.06
	0 to 1000'	*Special 1.04	*Special 1.04	*Special 1.035	*Special 1.035	*Special 1.03
	1000' to 1500'	*Special 1.05	*Special 1.05	*Special 1.05	*Special 1.05	*Special 1.05
14-30	0 to 800'	Regular 1.05	Regular 1.05	Regular 1.05	Regular 1.05	Regular 1.05
	800' to 1500'	Regular 1.07	Regular 1.07	Regular 1.07	Regular 1.07	Regular 1.07
	0 to 800'	*Special 1.035	*Special 1.035	*Special 1.03	*Special 1.035	*Special 1.03
	800' to 1500'	*Special 1.05	*Special 1.05	*Special 1.05	*Special 1.05	*Special 1.05
31-62	0 to 800'	Regular 1.06	Regular 1.06	Regular 1.05	Regular 1.05	----------
	800' to 1500'	Regular 1.08	Regular 1.08	Regular 1.08	Regular 1.08	----------
	0 to 800'	*Special 1.05	*Special 1.05	*Special 1.04	*Special 1.04	----------
	800' to 1500'	*Special 1.05	*Special 1.05	*Special 1.05	*Special 1.05	----------
31-52	0 to 800'	----------	----------	----------	----------	Regular 1.05
	800' to 1500'	----------	----------	----------	----------	Regular 1.08
	0 to 800'	----------	----------	----------	----------	*Special 1.04
	800' to 1500'	----------	----------	----------	----------	*Special 1.05

*SPECIAL with application of our factory-installed tuners, DIELECTRIC has the capability of producing improved VSWRs. Contact factory for tuner applications and optimization details.

TABLE II

Recommended Maximum Transmission Line Lengths

for Dielectric Dehydrators

Model	1-5/8"	3-1/8"	4-1/16"	6-1/8"	7-3/16"	8-3/16"	9-3/16"
MX 200	5,800'	1,500'	875'	375'	280'	214'	169'
600	XXX	3,000'	1,700'	750'	555'	425'	325'
19-507-1200	XXX	6,000'	3,550'	1,525'	1,110'	850'	675'
19-507-2400	XXX	XXX	6,808'	2,974'	2,155'	1,650'	1,300'
19-507-3600	XXX	XXX	XXX	4,475'	3,265'	2,500'	1,975'

XXX = Greater than 10,000 ft.
IM 1600 Capabilities same as 19-507-2400
IM 2400 Capabilities same as 19-507-3600
All lengths are in feet

TABLE III

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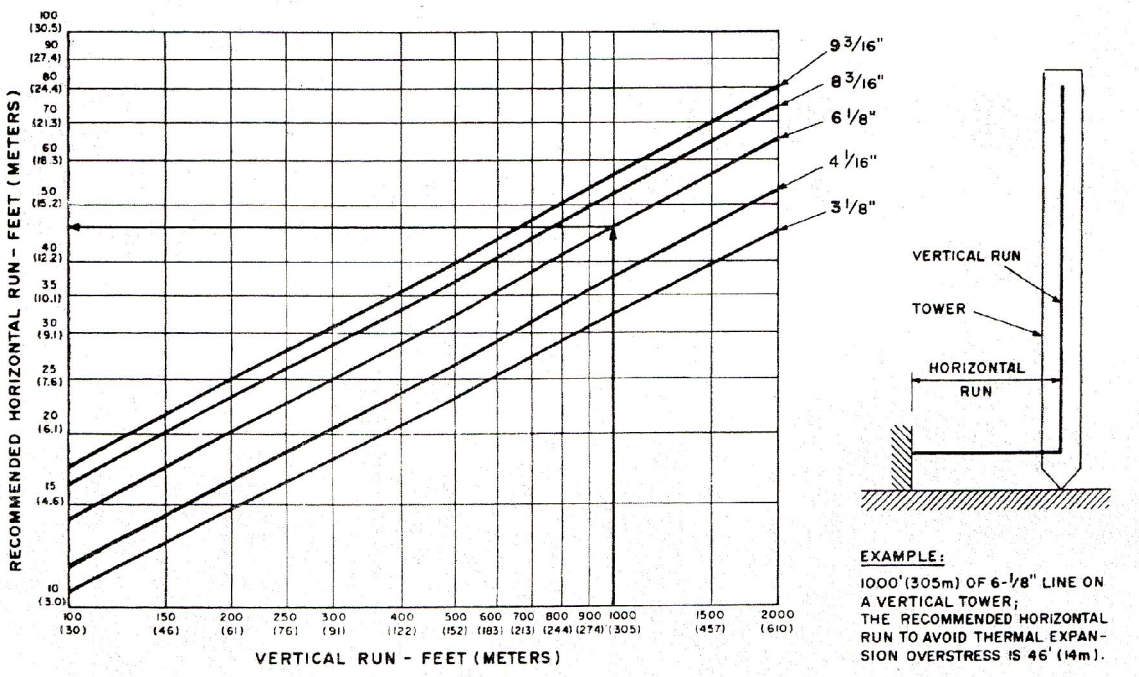


TABLE IV

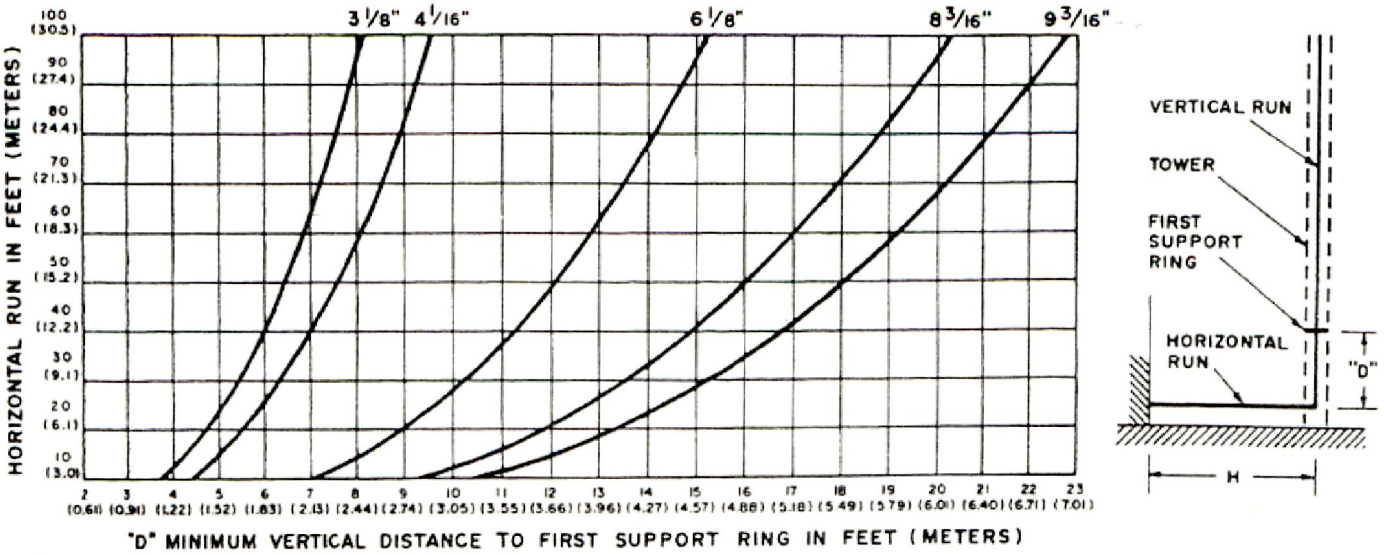


TABLE V

Hardware Torque Specifications

HARDWARE DESCRIPTION	RECOMMENDED TORQUE MATERIAL 18–8 SST.
1/4–20	70 IN. LB.
5/16–18	130 IN. LB.
3/8–16	210 IN. LB.
1/2–13	480 IN. LB. = 40 FT. LB.
5/8–11	1080 IN. LB. = 90 FT. LB.
3/4–10	1440 IN. LB. = 120 FT. LB.
1–8	285 FT. LB.
1 1/8–7	413 FT. LB.
1 1/4–7	523 FT. LB.
1 3/8–6	688 FT. LB.
1 1/2–6	888 FT. LB.

TABLE VI

Hanger Clamp Torque Specifications

HARDWARE DESCRIPTION	RECOMMENDED TORQUE MATERIAL 18–8 SST.
HOSE CLAMPS	40 – 50 IN. LB.

NOTE:
HOSE CLAMPS MUST BE ORIENTED PERPENDICULAR TO THE AXIS OF THE OBJECT ON WHICH THEY ARE TO BE MOUNTED.
(HOSE CLAMP BAND, FLAT ON THE OBJECT SURFACE)

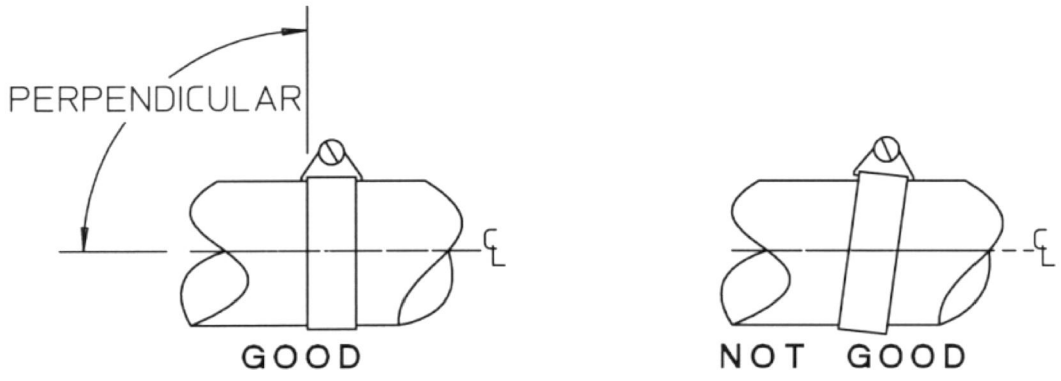


TABLE VII

SPRING LOADING DIMENSIONS FOR EXPANSION HANGERS

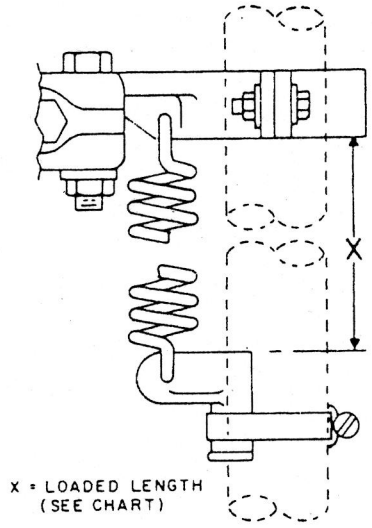


FIG. 1

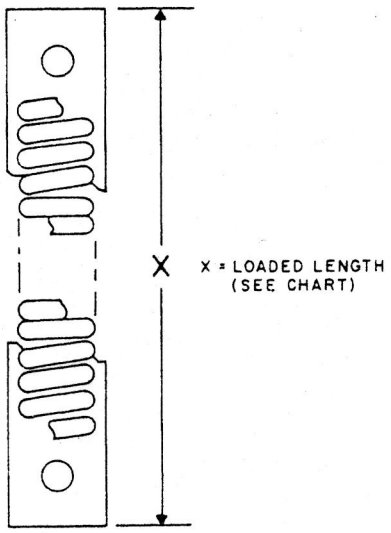


FIG. 2

Single 1-5/8 Inch Line (See Fig. 1)

Distance **DOWN** From Lowest Fixed Hanger		Loaded Length (Dimension "X") at Ambient Temperature at Time of Installation									
		0º F - 20º F (-18º C - -7º C)		**20º F - 40º F (-7º C - 4º C)**		**40º F - 60º F (4º C - 16º C)**		**60º F - 80º F (16º C - 27º C)**		**80º F - 100º F (27º C - 38º C)**	
Feet	Meters	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0 - 200	0 - 61	14 1/4	362	14 1/4	362	14 3/8	365	14 1/2	368	14 1/2	
200 - 400	61 - 122	14	356	14 1/8	359	14 3/8	365	14 5/8	371	14 3/4	
400 - 600	122 - 183	13 3/4	349	14 1/8	359	14 3/8	365	14 5/8	371	14 7/8	
600 - 800	183 - 244	13 5/8	346	14	356	14 3/8	365	14 3/4	375	15 1/8	
800 - 1000	244 - 305	13 3/8	340	13 7/8	352	14 3/8	365	14 7/8	378	15 1/4	
1000 - 1200	305 - 366	13 1/4	337	13 3/4	349	14 3/8	365	14 7/8	378	15 1/2	

Dual 1-5/8 Inch Line (See Fig. 2)

Distance **DOWN** From Lowest Fixed Hanger		Loaded Length (Dimension "X") at Ambient Temperature at Time of Installation									
		0º F - 20º F (-18º C - -7º C)		**20º F - 40º F (-7º C - 4º C)**		**40º F - 60º F (4º C - 16º C)**		**60º F - 80º F (16º C - 27º C)**		**80º F - 100º F (27º C - 38º C)**	
Feet	Meters	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0 - 200	0 - 61	19 1/8	486	19 1/4	489	19 1/4	489	19 3/8	492	19 3/8	492
200 - 400	61 - 122	18 7/8	479	19 1/8	486	19 1/4	489	19 1/2	495	19 5/8	498
400 - 600	122 - 183	18 3/4	476	19	483	19 1/4	489	19 1/2	495	19 7/8	505
600 - 800	183 - 244	18 1/2	470	18 7/8	479	19 1/4	489	19 5/8	498	20	508
800 - 1000	244 - 305	18 5/8	473	18 3/4	476	19 1/4	489	19 3/4	502	20 1/4	514
1000 - 1200	305 - 366	18 1/4	464	18 3/4	476	19 1/4	489	19 3/4	502	20 3/8	518

Single 3 1/8-Inch Line (See Fig. 1)

Distance **DOWN** From Lowest Fixed Hanger		Loaded Length (Dimension "X") at Ambient Temperature at Time of Installation									
		0º F - 20º F (-18º C - -7º C)		**20º F - 40º F (-7º C - 4º C)**		**40º F - 60º F (4º C - 16º C)**		**60º F - 80º F (16º C - 27º C)**		**80º F - 100º F (27º C - 38º C)**	
Feet	Meters	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0 - 200	0 - 61	16 1/4	413	16 3/8	416	16 3/8	416	16 1/2	419	16 5/8	422
200 - 400	61 - 122	16	406	16 1/4	413	16 3/8	416	16 5/8	422	16 7/8	429
400 - 600	122 - 183	15 3/4	400	16	406	16 3/8	416	16 3/4	425	17 1/8	435
600 - 800	183 - 244	15 1/2	394	15 7/8	403	16 3/8	416	16 7/8	429	17 3/8	441
800 - 1000	244 - 305	15 1/4	387	15 3/4	400	16 3/8	416	17	432	17 5/8	448
1000 - 1200	305 - 366	15	381	15 3/4	400	16 3/8	416	17 1/8	435	17 3/4	451
1200 - 1400	366 - 427	14 7/8	378	15 5/8	397	16 3/8	416	17 1/8	435	17 7/8	454
1400 - 1600	427 - 488	14 3/4	375	15 5/8	397	16 3/8	416	17 1/4	438	18	457
1600 - 1800	488 - 549	14 5/8	371	15 1/2	394	16 3/8	416	17 1/4	438	18 1/8	460
1800 - 2000	549 - 610	14 1/2	368	15 1/2	394	16 3/8	416	17 3/8	441	18 1/4	464

Dual 3 1/8-Inch Line (See Fig. 2)

Distance **DOWN** From Lowest Fixed Hanger		Loaded Length (Dimension "X") at Ambient Temperature at Time of Installation									
		0º F - 20º F (-18º C - -7º C)		**20º F - 40º F (-7º C - 4º C)**		**40º F - 60º F (4º C - 16º C)**		**60º F - 80º F (16º C - 27º C)**		**80º F - 100º F (27º C - 38º C)**	
Feet	Meters	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0 - 200	0 - 61	24 1/4	616	24 5/8	625	24 3/4	629	24 3/4	629	24 7/8	632
200 - 400	61 - 122	24 1/4	616	24 1/2	622	24 3/4	629	24 7/8	632	25 1/8	638
400 - 600	122 - 183	24	610	24 3/8	619	24 3/4	629	25	635	25 3/8	645
600 - 800	183 - 244	23 3/4	603	24 1/4	616	24 3/4	629	25 1/8	638	25 5/8	651
800 - 1000	244 - 305	23 1/2	597	24 1/8	613	24 3/4	629	25 1/4	641	25 7/8	657
1000 - 1200	305 - 366	23 3/8	594	24	610	24 3/4	629	25 3/8	645	26 1/8	664
1200 - 1400	366 - 427	23 1/8	587	23 7/8	606	24 3/4	629	25 1/2	648	26 1/4	667
1400 - 1600	427 - 488	23	584	23 7/8	606	24 3/4	629	25 1/2	648	26 3/8	670
1600 - 1800	488 - 549	22 7/8	581	23 3/4	603	24 3/4	629	25 5/8	651	26 1/2	673
1800 - 2000	549 - 610	22 3/4	578	23 3/4	603	24 3/4	629	25 5/8	651	26 5/8	676

Single 4 1/16-Inch Line (See Fig. 1)

Distance **DOWN** From Lowest Fixed Hanger		Loaded Length (Dimension "X") at Ambient Temperature at Time of Installation									
		0º F - 20º F (-18º C - -7º C)		**20º F - 40º F (-7º C - 4º C)**		**40º F - 60º F (4º C - 16º C)**		**60º F - 80º F (16º C - 27º C)**		**80º F - 100º F (27º C - 38º C)**	
Feet	Meters	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0 - 200	0 - 61	17 7/8	454	18	457	18 1/8	460	18 1/8	460	18 1/4	464
200 - 400	61 - 122	17 5/8	448	17 7/8	454	18 1/8	460	18 1/4	464	18 1/2	470
400 - 600	122 - 183	17 3/8	441	17 3/4	451	18 1/8	460	18 3/8	467	18 3/4	476
600 - 800	183 - 244	17 1/4	438	17 5/8	448	18 1/8	460	18 1/2	470	19	483
800 - 1000	244 - 305	17	432	17 1/2	445	18 1/8	460	18 5/8	473	19 1/8	486
1000 - 1200	305 - 366	16 3/4	425	17 1/2	445	18 1/8	460	18 3/4	476	19 3/8	492
1200 - 1400	366 - 427	16 5/8	422	17 3/8	441	18 1/8	460	18 3/4	476	19 1/2	495
1400 - 1600	427 - 488	16 1/2	419	17 1/4	438	18 1/8	460	18 7/8	479	19 5/8	498
1600 - 1800	488 - 549	16 3/8	416	17 1/4	438	18 1/8	460	18 7/8	479	19 3/4	502
1800 - 2000	549 - 610	16 1/4	413	17 1/8	435	18 1/8	460	19	483	19 7/8	505

Single 6 1/8-Inch Line 75 Ohm (See Fig. 2)

Distance **DOWN** From Lowest Fixed Hanger		Loaded Length (Dimension "X") at Ambient Temperature at Time of Installation									
		0º F - 20º F (-18º C - -7º C)		**20º F - 40º F (-7º C - 4º C)**		**40º F - 60º F (4º C - 16º C)**		**60º F - 80º F (16º C - 27º C)**		**80º F - 100º F (27º C - 38º C)**	
Feet	Meters	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0 - 200	0 - 61	32	813	32	813	32 1/8	816	32 1/8	816	32 1/4	819
200 - 400	61 - 122	31 3/4	806	31 7/8	810	32 1/8	816	32 3/8	822	32 1/2	826
400 - 600	122 - 183	31 3/8	797	31 3/4	806	32 1/8	816	32 1/2	826	32 7/8	835
600 - 800	183 - 244	31 1/8	791	31 5/8	803	32 1/8	816	32 5/8	829	33 1/8	841
800 - 1000	244 - 305	30 7/8	784	31 1/2	800	32 1/8	816	32 3/4	832	33 3/8	848
1000 - 1200	305 - 366	30 5/8	778	31 3/8	797	32 1/8	816	32 7/8	835	33 5/8	854
1200 - 1400	366 - 427	30 1/2	775	31 1/4	794	32 1/8	816	33	838	33 3/4	857
1400 - 1600	427 - 488	30 1/4	768	31 1/8	791	32 1/8	816	33	838	34	864
1600 - 1800	488 - 549	30	762	31 1/8	791	32 1/8	816	33 1/8	841	34 1/8	867
1800 - 2000	549 - 610	29 7/8	759	31	787	32 1/8	816	33 1/4	845	34 1/4	870

Single 6 1/8-Inch Line 50 Ohm (See Fig. 2)

Distance **DOWN** From Lowest Fixed Hanger		Loaded Length (Dimension "X") at Ambient Temperature at Time of Installation									
		0º F - 20º F (-18º C - -7º C)		**20º F - 40º F (-7º C - 4º C)**		**40º F - 60º F (4º C - 16º C)**		**60º F - 80º F (16º C - 27º C)**		**80º F - 100º F (27º C - 38º C)**	
Feet	Meters	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0 - 200	0 - 61	34 1/8	867	34 1/4	870	34 3/8	873	34 3/8	873	34 1/2	876
200 - 400	61 - 122	33 7/8	860	34 1/8	867	34 3/8	873	34 1/2	876	34 3/4	883
400 - 600	122 - 183	33 5/8	854	34	864	34 3/8	873	34 5/8	879	35	889
600 - 800	183 - 244	33 3/8	848	33 7/8	860	34 3/8	873	34 3/4	883	35 1/4	895
800 - 1000	244 - 305	33 1/8	841	33 3/4	857	34 3/8	873	34 7/8	886	35 1/2	902
1000 - 1200	305 - 366	32 7/8	835	33 5/8	854	34 3/8	873	35	889	35 3/4	908
1200 - 1400	366 - 427	32 5/8	829	33 1/2	851	34 3/8	873	35 1/8	892	36	914
1400 - 1600	427 - 488	32 1/2	826	33 3/8	848	34 3/8	873	35 1/4	895	36 1/8	918
1600 - 1800	488 - 549	32 1/4	819	33 1/4	845	34 3/8	873	35 3/8	899	36 3/8	924
1800 - 2000	549 - 610	32 1/8	816	33 1/4	845	34 3/8	873	35 1/2	902	36 1/2	927

Single 7 3/16-Inch 75 Ohm Vertical Spring Hanger (See Fig. 2)

Distance **DOWN** From Lowest Fixed Hanger		Loaded Length (Dimension "X") at Ambient Temperature at Time of Installation									
		0º F - 20º F (-18º C - -7º C)		**20º F - 40º F (-7º C - 4º C)**		**40º F - 60º F (4º C - 16º C)**		**60º F - 80º F (16º C - 27º C)**		**80º F - 100º F (27º C - 38º C)**	
Feet	Meters	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0 - 200	0 - 61	33 5/8	854	33 3/4	857	33 7/8	860	33 7/8	860	34	864
200 - 400	61 - 122	33 3/8	848	33 5/8	854	33 7/8	860	34	864	34 1/4	870
400 - 600	122 - 183	33 1/8	841	33 1/2	851	33 7/8	860	34 1/4	870	34 1/2	876
600 - 800	183 - 244	32 7/8	835	33 3/8	848	33 7/8	860	34 3/8	873	34 7/8	886
800 - 1000	244 - 305	32 5/8	829	33 1/4	845	33 7/8	860	34 1/2	876	35 1/8	892
1000 - 1200	305 - 366	32 3/8	822	33 1/8	841	33 7/8	860	34 5/8	879	35 3/8	899
1200 - 1400	366 - 427	32 1/8	816	33	838	33 7/8	860	34 3/4	883	35 5/8	905
1400 - 1600	427 - 488	32	813	33	838	33 7/8	860	34 3/4	883	35 3/4	908
1600 - 1800	488 - 549	31 7/8	810	32 7/8	835	33 7/8	860	34 7/8	886	35 7/8	911
1800 - 2000	549 - 610	31 3/4	806	32 3/4	832	33 7/8	860	35	889	36	914

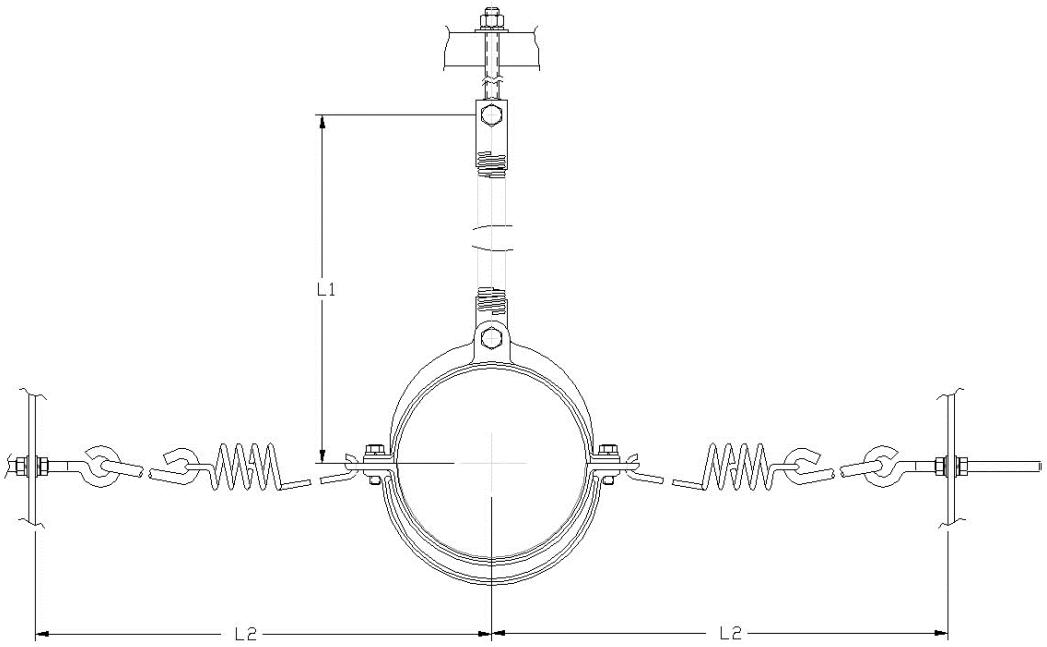
Single 8 3/16-Inch Line (See Fig. 2)

Distance **DOWN** From Lowest Fixed Hanger		Loaded Length (Dimension "X") at Ambient Temperature at Time of Installation									
		0º F - 20º F (-18º C - -7º C)		**20º F - 40º F (-7º C - 4º C)**		**40º F - 60º F (4º C - 16º C)**		**60º F - 80º F (16º C - 27º C)**		**80º F - 100º F (27º C - 38º C)**	
Feet	Meters	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0 - 200	0 - 61	27 3/4	704	27 7/8	706	28	711	28	711	28 1/8	714
200 - 400	61 - 122	27 1/2	699	27 3/4	704	28	711	28 1/4	717	28 3/8	720
400 - 600	122 - 183	27 1/4	692	27 5/8	702	28	711	28 3/8	720	28 3/4	730
600 - 800	183 - 244	27	686	27 1/2	699	28	711	28 1/2	724	29	737
800 - 1000	244 - 305	26 3/4	679	27 3/8	693	28	711	28 5/8	733	29 1/4	743
1000 - 1200	305 - 366	26 1/2	673	27 1/4	692	28	711	28 3/4	730	29 1/2	749
1200 - 1400	366 - 427	26 1/4	666	27 1/8	689	28	711	28 7/8	733	29 5/8	755
1400 - 1600	427 - 488	26 1/8	664	27	686	28	711	28 7/8	733	29 7/8	759
1600 - 1800	488 - 549	25 7/8	655	27	686	28	711	29	737	30	762
1800 - 2000	549 - 610	25 3/4	654	26 7/8	683	28	711	29 1/8	740	30 1/8	765

Single 9 3/16-Inch Line (See Fig. 2)

Distance **DOWN** From Lowest Fixed Hanger		Loaded Length (Dimension "X") at Ambient Temperature at Time of Installation									
		0º F - 20º F (-18º C - -7º C)		**20º F - 40º F (-7º C - 4º C)**		**40º F - 60º F (4º C - 16º C)**		**60º F - 80º F (16º C - 27º C)**		**80º F - 100º F (27º C - 38º C)**	
Feet	Meters	inch	mm	inch	mm	inch	mm	inch	mm	inch	mm
0 - 200	0 - 61	31 1/8	791	31 1/8	791	31 1/4	794	31 1/4	794	31 3/8	797
200 - 400	61 - 122	30 3/4	781	31	787	31 1/4	794	31 1/2	800	31 5/8	803
400 - 600	122 - 183	30 1/2	775	30 7/8	784	31 1/4	794	31 5/8	803	31 7/8	809
600 - 800	183 - 244	30 1/4	768	30 3/4	781	31 1/4	794	31 3/4	806	32 1/8	815
800 - 1000	244 - 305	30	762	30 5/8	778	31 1/4	794	31 7/8	809	31 1/2	826
1000 - 1200	305 - 366	29 3/4	756	30 1/2	775	31 1/4	794	32	812	32 3/8	822
1200 - 1400	366 - 427	29 1/2	749	30 5/8	779	31 1/4	794	32 1/8	815	32 7/8	835
1400 - 1600	427 - 488	29 1/4	743	30 1/4	768	31 1/4	794	32 1/8	815	33 1/8	841
1600 - 1800	488 - 549	29 1/8	740	30 1/8	765	31 1/4	794	32 1/4	819	33 7/8	841
1800 - 2000	549 - 610	28 7/8	733	30	762	31 1/4	794	32 3/8	822	33 1/2	850

Single Horizontal Three-Point Suspension Hangers
Free Length-No Load



T/L SIZE	CATALOG NUMBER	L1	L2	APPROX. WT.
3 1/8"	370-032	15 1/8"	15"	5 LBS
4 1/16"	470-032	18 1/2"	17 1/4"	7 LBS
6 1/8"	670-032	23 3/4"	16 3/4"	12 LBS
7 3/16"	770-032	24 1/4"	17 3/8"	20 LBS
8 3/16"	870-032	24 3/4"	17 7/8"	30 LBS
9 3/16"	970-032	25 1/4"	18 3/8"	18 LBS

Special Instructions
for
digi*TL*ine Installations
excluding Ultimate Connectors

In order to achieve the extreme broadband performance that Dielectric's digi*TL*ine is capable of, each connector must be properly seated during installation.

In order to accomplish this, the installation should begin at the transmitter end of the horizontal run with line section number 1. After each transmission line section is bolted on, the inner conductor must be seated on the anchor connector of the previous section. This is done by inserting the connector seating tool (essentially a 10" long, 3/4" diameter rod) into the exposed connector until it bottoms out on the first magneformed bushing. Then by pushing or gently tapping with a rubber mallet, the inner conductor is seated onto the previous anchor connector. The total amount of inner conductor travel should be about .25".

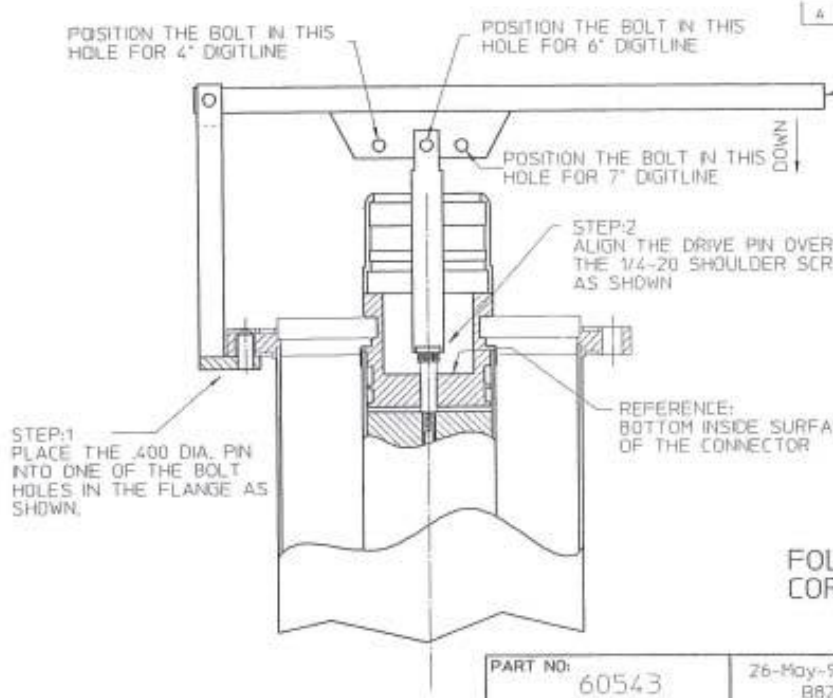
This process is repeated for every flange joint in the horizontal and vertical run.

******NOTE******

Failure to follow these instructions will result in degraded VSWR performance.
If you have any questions, please call Dielectric at 1-207-655-8100

Note: This product may be covered by one or more of the following patents: 6,816,040; 6,650,209; 4,654,962; 5,455,548 or 5,401,173. Additional patents may be pending.

REVISIONS			
SYM	DESCRIPTION	DATE	APPROVED
A	ADDED NEW PIECE TO ALLOW 7" TO WORK	K.J. 5-26-98	



STEP:4
ONCE COMPLETING STEPS 1 THRU 3 REMOVE THE TOOL AND ASSEMBLE THE NEXT PIECE OF COAX AND REPEAT THE PROCESS AS REQUIRED.

FOLLOW STEPS 1 THRU 4 FOR CORRECT INSTALLATION PROCEDURES

PART NO: 60543	26-May-98 7:44:01 B82608	Dielectric, A Unit of SPX Corporation
MATERIAL: FOR ASSY DRAWING SEE C82607	DIMENSIONAL TOLERANCES (UNLESS OTHERWISE NOTED) 3 PLACE DIMENSIONS ±.005; 2 PLACE DIMENSIONS ±.02; ANGULAR DIMENSIONS ±0°30'; REF DIMENSIONS ARE NOT FOR MANUFACTURING OR INSPECTION	TITLE: SET TOOL INSTRUCTION DRAWING FOR 4", 6" & 7" DIGITLINE
FINISH:	DATE: 9/15/97 DS; DRAWN: Laurie; CHECK: ; MFG APPVL: ; ENG APPVL: KEVIN	CODE IDENT NO 08441 B 82608 REV: A; SCALE: ; SHEET:

PART NO: 60543 DWG REV: A
TITLE: SET TOOL 4" 6" & 7" DIGITLINE
DRN BY: KJL DWG NO: B2608